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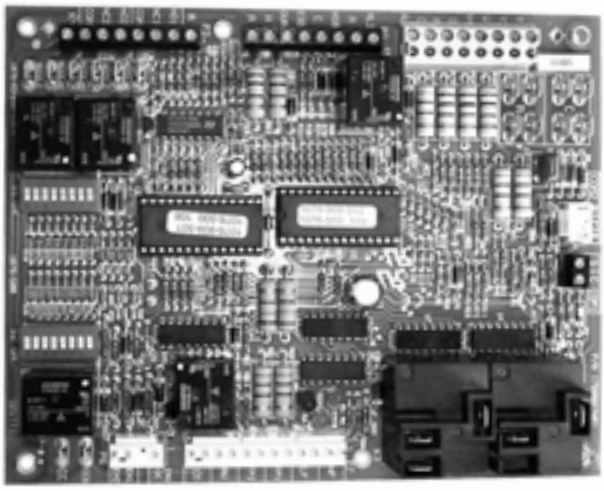
# Installation, Operation & Maintenance Manual

# DXM Digital Heat Pump Controllers



**SPECIAL NOTE:**
Any references to any LON Controls or modules will only apply to models manufactured before 10/28/2021.

**SERIAL NUMBER:**

| 22 | 44 | 1 |
|---|---|---|
| *Year* | *Week* | *Factory* |

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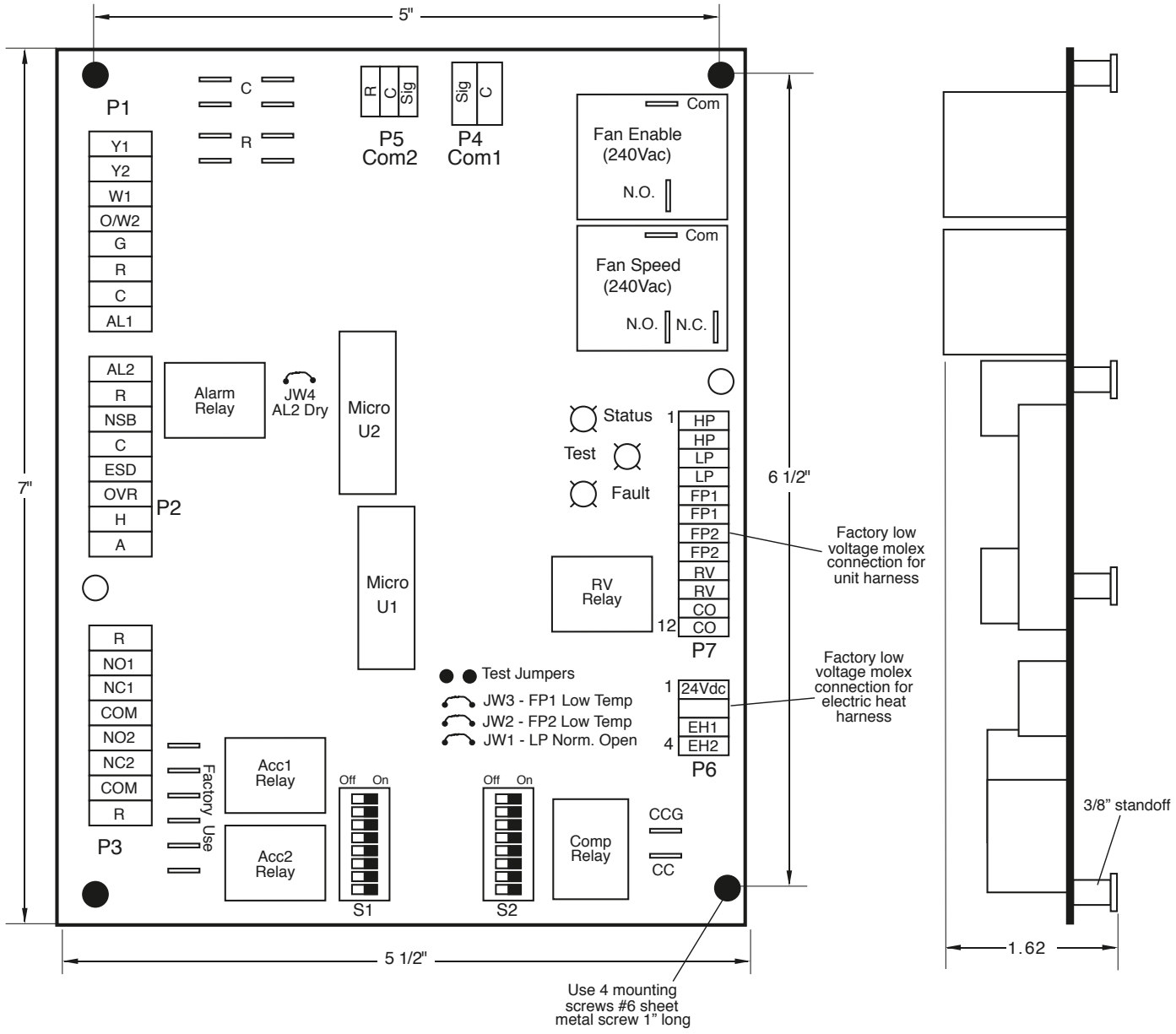
S = Standard  O = Optional  DDC = Feature can be provided by DDC System

DXM-Lon = DXM with LonMark Module  DXM-MPC = DXM with MPC Module

* = Check with your Factory Representative for model availability  MPC = Multiple ProtoCol (BACNET, N2, Modbus)

† = Compatible with our thermostats. For customer supplied thermostat, check with Controls Engineering Department for approval.

## DXM Physical Dimensions & Layout



## DXM Controls

**Field Selectable Inputs**
Test Mode - Test Mode allows the service personnel to check the operation of the control in a timely manner. By momentarily shorting the test terminals, the DXM Control enters a 20 minute Test Mode period in which all time delays are sped up 15 times. During Test Mode, the test LED will turn on. For diagnostic ease at the thermostat, the Alarm Relay will also cycle during Test Mode. The Alarm Relay will cycle on and off similar to the fault LED to indicate a code representing the last fault, at the thermostat.
**Note: Code 1 indicates there is no fault in memory; stated differently, the control has not faulted since the last power-down to power-up sequence.**

Test Mode can be exited by shorting the test terminals for 3 seconds. Test Mode can also be entered and exited by cycling the G input, 3 times within a 60 second time period.

During Test Mode, the control monitors to see if the FP1 and FP2 thermistors are in the appropriate place. If the control is in Test Mode, the control will lockout, with Code 9, after 30 seconds if:
a) the compressor is On in Cooling Mode and the FP1 sensor is colder than the FP2 sensor. or,
b) the compressor is On in Heating Mode and the FP2 sensor is colder than the FP1 sensor.

**Retry Mode** - If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in process of retrying.
**Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the DXM Control.**

**Note: Jumpers 2 & 3 must not be clipped prior to adding antifreeze to the water loop. Antifreeze protection to 15°F required. Clipping JW2 & JW3 without antifreeze may result in freeze damage and will void the unit warranty.**

**Water Coil Low Temperature Cut-Out Limit Setting** - Jumper 3 (JW3-FP1 Low Temp) provides field selection of temperature limit setting for FP1 to be 30°F or 10°F.
Not Clipped = 30°F. Clipped = 10°F.

**Air Coil Low Temperature Cut-Out Limit Setting -** Jumper 2 (JW2-FP2 Low Temp) provides field selection of temperature limit setting for FP2 to be 30°F or 10°F.
Not Clipped = 30°F. Clipped = 10°F.

**Alarm Relay Setting** - Jumper 4 (JW4-AL2 Dry) provides field selection of Alarm Relay terminal AL2 to be jumpered to 24VAC or to be dry (no connection).
Not Clipped = AL2 connected to R.
Clipped = AL2 dry contacts (no connection).

**Low Pressure Normally Open** - Jumper 1 (JW1-LP Norm Open) Provides field selection for low pressure input to be normally closed or normally open.
Not Clipped = LP normally closed.
Clipped = LP normally open.

**DIP Switches**

**Note: In the following field configuration options, DIP switches should only be moved when power is removed from the DXM Control to ensure proper operation.**

**DIP Package #1 (S1)**
DIP Package #1 is 8 position and provides the following setup selections.

**DIP 1.1:** Unit Performance Sentinel Disable - Provides field selection to disable the UPS feature.
On = Enabled. Off = Disabled.

**DIP 1.2:** Compressor Relay Staging Operation - Provides selection of Compressor Relay staging operation. The Compressor Relay can be selected to turn on with Stage 1 or Stage 2 call from the thermostat. This is used with Dual Stage units (2 compressors where 2 DXM Controls are being used) or with master/slave applications. In master/slave applications, each compressor and fan will stage according to its appropriate DIP 1.2. If set to stage 2, the compressor will have a 3 second on-delay before energizing during a Stage 2 demand. Also, if set for stage 2, the Alarm Relay will NOT cycle during Test Mode.
On = Stage 1. Off = Stage 2.

**DIP 1.3:** Thermostat Type (Heat/Cool) - Provides selection of thermostat type. Heat Pump or Heat/Cool thermostats can be selected. When in Heat/Cool Mode, Y1 is input call for Cooling Stage 1, Y2 is input call for Cooling Stage 2, W1 is input call for Heating Stage 1, and O/W2 is input call for Heating Stage 2. In Heat Pump Mode, Y1 is input call for Compressor Stage 1, Y2 is input call for Compressor Stage 2, W1 is input call for Heating Stage 3 or Emergency Heat, and O/W2 is the input call for RV (heating or cooling dependent upon DIP 1.4).
On = Heat Pump. Off = Heat/Cool.

**DIP 1.4:** Thermostat Type (O/B) - Provides selection of thermostat type. Heat pump thermostats with "O" output on with Cooling or "B" output on with Heating can be selected.
On = HP Stat with O output with cooling. Off = HP Stat with B output with heating.

**DIP 1.5:** Dehumidification Mode - Provides selection of normal or Dehumidification Fan Mode. In Dehumidification Mode, the fan speed relay will remain off during Cooling Stage 2. In Normal Mode, the fan speed relay will turn on during Cooling Stage 2.
On = Normal Fan Mode. Off = Dehumidification Mode.

**DIP 1.6:** DDC Output at EH2 - DIP Switch 1.6 provides selection for DDC operation. If set to DDC Output at EH2, the EH2 terminal will continuously output the last fault code of the controller. If set to EH2 normal, then the EH2 will operate as standard electric heat output.
On = EH2 Normal. Off = DDC Output at EH2.

**DIP 1.7:** Boilerless Operation - Provides selection of Boilerless Operation. In Boilerless Mode, only the compressor is used for Heating Mode when FP1 is above the temperature specified by the setting of DIP 1.8. If DIP 1.8 is set for 50°F, then the compressor is used for heating as long as FP1 is above 50°F. Below 50°F, the compressor is not used and the control goes into Emergency Heat Mode, staging on EH1 and EH2 to provide heating.

If a thermal switch is being used in place of the FP1 thermistor, then only the compressor will be used for Heating Mode when the FP1 terminals are closed. If the FP1 terminals are open, then the compressor is not used and the control goes into Emergency Heat Mode.

**Table 1: Accessory Relay 1 Configuration**

| DIP 2.1 | DIP 2.2 | DIP 2.3 | ACC1 Relay Option |
|---|---|---|---|
| ON | ON | ON | Cycle with fan |
| OFF | ON | ON | Digital NSB |
| ON | OFF | ON | Water Valve - Slow opening |
| ON | ON | OFF | OAD |
| OFF | OFF | OFF | Reheat Option - Humidistat |
| OFF | ON | OFF | Reheat Option - Dehumidistat |

All other DIP combinations are invalid

**Table 2: Accessory Relay 2 Configuration**

| DIP 2.4 | DIP 2.5 | DIP 2.6 | ACC2 Relay Option |
|---|---|---|---|
| ON | ON | ON | Cycle with compressor |
| OFF | ON | ON | Digital NSB |
| ON | OFF | ON | Water Valve - Slow Opening |
| ON | ON | OFF | OAD |

All other DIP combinations are invalid

On = normal. Off = Boilerless operation.
DIP 1.8: Boilerless Changeover Temperature - Provides selection of boilerless changeover temperature setpoint.
On = 50°F. Off = 40°F.

**DIP Package #2 (S2)**
DIP Package #2 is 8 position and provides the following setup selections.

**DIP 2.1:** Accessory1 relay personality - Provides selection of Acc1 relay personality. See Table 2.
**DIP 2.2:** Accessory1 relay personality - Provides selection of Acc1 relay personality. See Table 2.
**DIP 2.3:** Accessory1 relay personality - Provides selection of Acc1 relay option. See Table 2.
**DIP 2.4:** Accessory2 relay personality - Provides selection of Acc2 relay personality. See Table 3.
**DIP 2.5:** Accessory2 relay personality - Provides selection of Acc2 relay personality. See Table 3.
**DIP 2.6:** Accessory2 relay personality - Provides selection of Acc2 relay option. See Table 3.
**DIP 2.7:** Auto Dehumidification Fan Mode or High Fan Mode - Provides selection of Auto Dehumidification Fan Mode or High Fan Mode. In Auto Dehumidification Mode, the Fan Speed relay will remain off during Cooling Stage 2 IF the H input is active. In High Fan Mode, the Fan Enable and Fan Speed relays will turn on when the H input is active.

On = Auto Dehumidification Mode. Off = High Fan Mode.

**DIP Switch 2.8:** Factory Setting - Normal position is On. Do not change selection unless instructed to do so by the Factory.

**Safety Features**
The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

**Anti-Short Cycle Protection** - The control features a 5 minute anti-short cycle protection for the compressor. **Note: The 5 minute anti-short cycle also occurs at power up.**

**Random Start** - The control features a 5-80 second random start upon power up. The random start delay will be present after a control power up and after returning from Night Setback or Emergency Shutdown modes.
Extended Compressor Operation Monitoring - If the compressor relay has been on for 4 continuous hours, then the control will automatically turn off the compressor

relay and wait the short cycle protection time. All appropriate safeties including the LP will be monitored during the off time. If all operation is normal, and if the compressor demand is still present, the control will turn the compressor back on.

**Fault Retry** - In Fault Retry Mode, the Status LED begins slow flashing to signal that the control is trying to recover from a fault input. The Fault LED will also begin flashing a code representing the last fault, which occurred. The DXM Control will stage off the outputs and then "try again" to satisfy the thermostat call for compressor. Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat call for compressor, then the control will go to Lockout Mode. The last fault causing the lockout will be stored in memory and is displayed by the Fault LED.
**Note: If "1 Try" is selected for FP1 and FP2, then there will be no "retries" for FP1 and FP2 faults. The control will only try one time for these faults.**

**Lockout** - In Lockout Mode, the Status LED will begin fast flashing. The Fault LED will be flashing a code representing the last fault, which occurred that caused the lockout. The compressor relay is turned off immediately. Lockout Mode can be soft reset via the thermostat by removing the call for compressor, or can be hard reset via the disconnect. The last fault causing the lockout will be stored in memory and is displayed by the Fault LED.

**Lockout with Emergency Heat** - If the DXM is configured for Heat Pump thermostat Mode (see DIP 1.3), the DXM is in Lockout Mode, and the W input becomes active, then Emergency Heat Mode will occur during Lockout.

**⚠ CAUTION! ⚠**

**CAUTION!** Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

**High Pressure Switch** - When the High Pressure Switch opens due to high refrigerant pressures, the Compressor relay is de-energized immediately since the High Pressure Switch is in series with the compressor contactor coil. The High Pressure Fault recognition is immediate as well. The Fault LED will immediately begin flashing Code 2 when a High Pressure Fault occurs.

High Pressure Lockout Code = 2

**Example: 2 quick flashes, 10-sec pause, 2 quick flashes, 10-sec. pause, etc.**

**Low Pressure Switch** - The Low Pressure Switch must be open and remain open for 30 continuous seconds during a compressor "on" cycle to be recognized as a Low Pressure fault. If the low pressure switch is open for 30 seconds prior to compressor power up it will be considered a low pressure (loss of charge) fault. The Low Pressure Switch input is bypassed for the initial 120 seconds of a compressor run cycle. The Fault LED will immediately begin flashing Code 3 when a Low Pressure Fault occurs.

Low Pressure Lockout Code = 3

**Water Coil Low Temperature Cut-Out Limit (FP1)** - The control will recognize an FP1 fault, during a compressor run cycle if:
a) the thermistor temperature is below the selected low temperature protection limit setting, AND
b) the thermistor temperature is rising (getting warmer) at a rate LESS than 2°F per 30 second time period.

The FP1 input is bypassed for the initial 120 seconds of a compressor run cycle. The Fault LED will immediately begin flashing Code 4 when a FP1 Fault occurs.

FP1 Lockout Code = 4

**Air Coil Low Temperature Cut-Out Limit (FP2)** - The control will recognize an FP2 fault, during a compressor run cycle if:
a) the thermistor temperature is below the selected low temperature protection limit setting, AND
b) the thermistor temperature is rising (getting warmer) at a rate LESS than 2°F per 30 second time period.

The FP2 input is bypassed for the initial 120 seconds of a compressor run cycle. The Fault LED will immediately begin flashing Code 5 when a FP2 Fault occurs.

FP2 Lockout Code = 5

**Condensate Overflow** - The Condensate Overflow sensor must sense overflow levels for 30 continuous seconds to be recognized as a CO fault. Condensate Overflow will be monitored at all times. The Fault LED will immediately begin flashing Code 6 when a Condensate Overflow Fault occurs. Condensate overflow will be monitored during compressor run cycle.

CO Lockout Code = 6

**Over/Under Voltage Shutdown** - An Over/Under Voltage condition exists when the control voltage is outside the range of 18VAC to 31.5VAC. Over/Under Voltage Shutdown is self-resetting in that if the voltage comes back within range of 18.5VAC to 31VAC for at least 0.5 seconds, then normal operation is restored. This is not considered a fault or lockout. If the DXM is in over/under voltage shutdown for 15 minutes, the Alarm Relay will close.
Over/Under Voltage Shutdown Code = 7

**Unit Performance Sentinel-UPS (patent pending)** - The UPS feature warns when the heat pump is operating inefficiently. A UPS condition exists when:
a) In Heating Mode with compressor energized, if FP2 is greater than 125°F for 30 continuous seconds, or
b) In Cooling Mode with compressor energized, if FP1 is greater than 125°F for 30 continuous seconds, OR FP2 is less than 40°F for 30 continuous seconds.

If a UPS condition occurs, the control will immediately go to UPS warning. The status LED will remain on as if the control is in Normal Mode. (see "LED and Alarm Relay Operation Table"). Outputs of the control, excluding Fault LED and Alarm Relay, will NOT be affected by UPS. The UPS condition cannot occur during a compressor off cycle. During UPS warning, the Alarm Relay will cycle on and off. The cycle rate will be On for 5 seconds, Off for 25 seconds, On for 5 seconds, Off for 25 seconds, etc.

Unit Performance Sentinel Warning Code = 8

**Swapped FP1/FP2 Thermistors** - During Test Mode, the control monitors to see if the FP1 and FP2 thermistors are in the appropriate place. If the control is in Test Mode, the control will lockout, with Code 9, after 30 seconds if:
a) the compressor is On in Cooling Mode and the FP1 sensor is colder than the FP2 sensor. Or,
b) the compressor is On in Heating Mode and the FP2 sensor is colder than the FP1 sensor.

Swapped FP1/FP2 Thermistor Code = 9.

**ESD** - The ESD (Emergency Shut Down) Mode is utilized when the ERV (Energy Recovery Ventilator) option is applied to an TRE series rooftop unit to indicate an ERV fault. A contact closure at the ERV unit will connect common to the ESD terminal, which will shut down the rooftop/ERV units. The green status light will flash code 3 when the unit is in ESD Mode. The ESD Mode can also be enabled from an external common signal to terminal ESD (see "Thermostat Inputs" section for details).

ESD Mode = code 3 (green "status" LED)

**Diagnostic Features** - The Status LED and Fault LED on the DXM Control advises service personnel of the current status of the DXM Control. The Status LED will indicate the current mode that the DXM Control is in. The Fault LED will ALWAYS flash a code representing the LAST fault in memory. If there is no fault on memory, then the Fault LED will flash Code 1. See Table 4 for a complete listing of codes.

**Table 3: LED and Alarm Relay Output Table**

| Description of Operation | Status LED (Green) | Test LED (Yellow) | Fault LED (Red) | Alarm Relay |
|---|---|---|---|---|
| Normal Mode | ON | - | OFF | Open |
| Normal Mode with UPS | ON | - | Flashing Code 8 | Cycle (Closed 5 seconds, open 25 seconds) |
| DXM is Non-functional | OFF | OFF | OFF | Open |
| Fault Retry | Slow Flash | - | Flashing Fault Code | Open |
| Lockout | Fast Flash | - | Flashing Fault Code | Closed |
| Test Mode | - | ON | - | - |
| Night Setback | Flashing Code 2 | - | - | - |
| ESD | Flashing Code 3 | - | - | - |
| Invalid T-Stat Inputs | Flashing Code 4 | - | - | - |
| HP Fault | Slow Flash | - | Flashing Code 2 | Open |
| LP Fault | Slow Flash | - | Flashing Code 3 | Open |
| FP1 Fault | Slow Flash | - | Flashing Code 4 | Open |
| FP2 Fault | Slow Flash | - | Flashing Code 5 | Open |
| CO Fault | Slow Flash | - | Flashing Code 6 | Open |
| Over/Under Voltage | Slow Flash | - | Flashing Code 7 | Open (Closed after 15 minutes) |

Notes:
a) "Flashing Appropriate Code" means that the Fault LED will ALWAYS flash a code representing the LAST fault in memory. If there is no fault in memory, the Fault LED will flash code 1.
b) Codes will be displayed with a 10 second Fault LED off period.
c) Slow flash will be 1 flash per every 2 seconds.
d) Fast flash will be 2 flash per every 1 second.
e) On pulse 1/3 sec.; off pulse 1/3 sec.

## UNIT OPERATION DESCRIPTION

**Power Up** - The unit will not operate until all the inputs and safety controls are checked for normal conditions.
**Note: The compressor will have a 5-minute anti-short cycle delay at power-up.**

**Standby/Fan Only** - In Standby Mode, the compressor will be off. The Fan Enable, Fan Speed, and RV relays may be on if appropriate inputs are present. If there is a Fan 1 demand, then the Fan Enable relay will turn on immediately. If there is a Fan 2 demand, then the Fan Enable and Fan Speed relays will turn on immediately.

**Note: DIP1.5 (Dehum Fan Mode Select) has no effect upon Fan 1 and Fan 2 outputs.**

The RV relay will not directly track the input demands for RV, the DXM Control will employ "smart RV" control. This ensures that the RV will only switch positions if the thermostat has called for a Heating/Cooling Mode change.

**Heating Stage 1** - In Heating Stage 1 Mode, the Fan Enable and Compressor relays are turned on immediately. If configured as Stage 2 (DIP1.2 = off), then the compressor and fan will not turn on until there is Stage 2 demand. The Fan Enable relay and Compressor relay are turned off immediately when the Heating Stage 1 demand is removed. The control reverts to Standby Mode. If there is a Master/Slave situation or a Dual Compressor situation, all Compressor relays and related functions will track with their associated DIP1.2.

**Heating Stage 2** - In Heating Stage 2 Mode, the Fan Enable and Compressor relays remain on. The Fan Speed relay is turned on immediately. The Fan Speed relay is turned off immediately when the Heating Stage 2 demand is removed. The control reverts to Heating Stage 1 Mode. If there is a Master/Slave situation or a Dual Compressor situation, all Compressor relays and related functions will track with their associated DIP1.2.

**Heating Stage 3** - In Heating Stage 3 Mode, the Fan Enable, Fan Speed and Compressor relays will remain on. EH1 output is turned on immediately. With continuing Heating Stage 3 demand, EH2 will turn on after 10 minutes. EH1 and EH2 are turned off immediately when the Heating Stage 3 demand is removed. The control reverts to Heating Stage 2 Mode. During Heating Stage 3 Mode, EH2 will be off (or will turn off if already on) if FP1 is greater than 45°F AND FP2 is greater than 110°F (FP2 greater than 110°F includes the condition that FP2 is shorted). This condition will have a 30-second recognition time. During Heating Stage 3 Mode, EH1, EH2, Fan Enable and Fan Speed will be on if the G input is not active.

**Emergency Heat** - In Emergency Heat Mode, the Fan Enable and Fan Speed relays are turned on. EH1 is turned on immediately. With continuing Emergency Heat demand, EH2 will turn on after 5 minutes. EH1 and EH2 are turned off immediately when the Emergency Heat demand is removed. The Fan Enable and Fan Speed relays will turn off after a 60-second delay. The control reverts to Standby Mode. During Emergency Heat Mode, EH1, EH2, Fan Enable and Fan Speed will be on if the G input is not active.

**Cooling Stage 1** - In Cooling Stage 1 Mode, the Fan Enable, Compressor, and RV relays are turned on immediately. If configured as Stage 2 (DIP1.2 = off), then the compressor and fan will not turn on until there is Stage 2 demand. The Fan Enable and Compressor relays are turned off immediately when the Cooling Stage 1 demand is removed. The control reverts to Standby Mode. The RV relay remains on until there is a Heating demand. If there is a Master/Slave situation or a Dual Compressor situation, all Compressor relays and related functions will track with their associated DIP1.2.

**Cooling Stage 2** - In Cooling Stage 2 Mode, the Fan Enable, Compressor, and RV relays remain on. The Fan Speed relay is turned on immediately (see DIP1.5). The Fan Speed relay is turned off immediately when the Cooling Stage 2 demand is removed. The control reverts to Cooling Stage 1 Mode. If there is a Master/Slave situation or a dual compressor situation, all compressor relays and related functions will track with their associated DIP1.2.

**Night Low Limit (NLL) Staged Heating** - In NLL Staged Heating Mode, the OVR input becomes active and is recognized as a call for Heating (OVR is an alternate means of calling for Heating Mode). In NLL Staged Heating Mode, the control will immediately go into Heating Stage 1 Mode with an additional 30 minutes of NLL demand, the control will go into Heating Stage 2 Mode. With an additional 30 minutes of NLL demand, the control will go into Heating Stage 3 Mode.

**Special DXM Application Notes** - Generally the following applications are based upon configuring the accessory relays.

**Cycle with Fan** - If Accessory relay 1 is configured to "cycle with fan", Accessory relay 1 will be on any time the Fan Enable relay is on.

**Cycle with Compressor** - If Accessory relay 2 is configured to "cycle with compressor", Accessory relay 2 will be on any time the Compressor relay is on.

**Digital Night Setback** - If an Accessory relay is configured for Digital NSB, the Accessory relay will be on any time the NSB input is connected to Ground "C". **Note: If there are no Accessory relays configured for Digital NSB, then the NSB and OVR inputs are automatically configured for "mechanical" operation. See Mechanical NSB operation below.**

**Note: Digital Night Setback feature requires a compatible thermostat. Contact manufacturer for information on compatible thermostats.**

**Mechanical Night Setback** - When the NSB input is connected to Ground "C", all thermostat inputs (G, Y1, Y2, W1, and O/W2) are ignored. A thermostat setback Heating call can then be connected to the OVR input. If the OVR input becomes active, then the DXM will enter NLL Staged Heating Mode. NLL Staged Heating Mode would then provide heating during the NSB period.

**Water Valve/Slow Opening** - If an Accessory relay is configured for Water Valve/Slow Opening, the Accessory relay will turn on 60 seconds prior to the Compressor Relay turning on.

**Outside Air Damper** - If an Accessory relay is configured for OAD, the Accessory relay will normally turn on any time the Fan Enable relay is on. But, following a return from NSB (NSB input no lrelonger connected to Ground "C") to Normal Mode, the Accessory Relay will not turn on for 30 minutes even if the Fan Enable Relay is on. After this 30-minute timer expires, the Accessory Relay will turn on if the Fan Enable Relay is on.

**Dehumidification Operation with DXM** - A heat pump equipped with a dedicated Dehumidification Mode can operate in three modes, cooling, cooling with reheat, and heating. The cooling/heating modes are like any of our other WSHP. The reversing valve ("O" signal) is energized in cooling, along with the compressor contactor(s) and blower relay. In the Heating Mode the reversing valve is de-energized. Almost any thermostat will activate the heat pump in heating or cooling modes. The Reheat Mode requires a either a separate humidistat/ dehumidistat or a thermostat that has an integrated dehumidification function for activation. The DXM board is configured to work with either a humidistat or dehumidistat input to terminal "H" (DIP switch settings for the DXM board are shown in table 2). Upon receiving an "H" input, the DXM board will activate the Cooling Mode and engage reheat. Table 5 shows the relationship between thermostat input signals and unit operation.

**Thermostat Inputs** - Table 5 shows the resulting demand from differing combinations of inputs.

**Y1 - Y1 is the input for compressor stage 1 if DIP1.3 = on. Y1 is the input for Cooling Stage 1 if DIP1.3 = off.**
**Y2** - Y2 is the input for compressor stage 2 if DIP1.3 = on. Y2 is the input for Cooling Stage 2 if DIP1.3 = off.
**W1** - If Y1 and Y2 are active and DIP1.3 = on, then W1 is the input for Heating Stage 3. If Y1 and Y2 are not active and DIP1.3 = on, then W1 is the input for Emergency Heat. If DIP1.3 = off, then W1 is the input for Heating Stage 1.

**O/W2** - O/W2 is the input for Reversing Valve Relay if DIP1.3 = on and DIP1.4 = on. O/W2 is the input for Heating Stage 2 if DIP1.3 = off. O/W2 is the input for

**Table 4: Thermostat Inputs with Resulting Demands**

| Thermostat Operating Modes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Input[3] | | | | | | Output | | | | | |
| | O/W2 | G | Y1 | Y2[4] | W1 | H | RV | Fan | 1st stg H/C | 2nd stg H/C[4] | AUX | Reheat |
| No Demand | ON/OFF | OFF | OFF | OFF | OFF | OFF | ON/OFF | OFF | OFF | OFF | OFF | OFF |
| Fan Only | ON/OFF | ON | OFF | OFF | OFF | OFF | ON/OFF | ON | OFF | OFF | OFF | OFF |
| Cooling 1st Stage | ON | ON | ON | OFF | OFF | OFF | ON | ON | ON | OFF | OFF | OFF |
| Cooling 2nd Stage | ON | ON | ON | ON | OFF | OFF | ON | ON | ON | ON | OFF | OFF |
| Cooling & Dehumidistat[1] | ON | ON | ON | ON/OFF | OFF | ON | ON | ON | ON | ON/OFF | OFF | OFF |
| Dehumidistat Only | ON/OFF | OFF | OFF | OFF | OFF | ON | ON | ON | ON | ON | OFF | ON |
| Heating 1st Stage | OFF | ON | ON | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF |
| Heating 2nd Stage | OFF | ON | ON | ON | OFF | OFF | OFF | ON | ON | ON | OFF | OFF |
| Heating 3rd Stage | OFF | ON | ON | ON | ON | OFF | OFF | ON | ON | ON | ON | OFF |
| Heating & Dehumidistat[2] | OFF | ON | ON | ON/OFF | ON/OFF | ON | OFF | ON | ON | ON/OFF | ON/OFF | OFF |

[1] Cooling input takes priority over dehumidify input.
[2] DXM is programmed to ignore the H demand when the unit is in heating mode.
[3] Above inputs assume DIP 1.3 is in the heat pump position, and DIP 1.4 is in the O position. When 1.3 is in the heat/cool position, Y1 & Y2 are used for cooling inputs; W1 and O/W2 are used for heating inputs. When 1.4 is in the B position, the O/W2 column would be opposite logic.
[4] N/A for single stage units; Full load operation for dual capacity units.
[5] ON/OFF = Either ON or OFF; H/C = Either Heating or Cooling.

"Heat Mode" if DIP1.3 = on and DIP1.4 = off; this means that the thermostat outputs a "B" call when in Heating Mode and does NOT have an "O" output. The DXM Control will employ "Smart RV" control. This ensures that the RV will only switch positions if the thermostat has called for a Heating/ Cooling Mode change.

**G** - G is the input for Fan Enable Relay.

**NSB and Override** - NSB is the input for Night Setback Mode. When Digital NSB is selected via the Accessory Relays DIPswitch inputs and the NSB input is connected to Ground "C", then the appropriately configured Accessory Relay is turned on to signal the digital thermostat to go to Night Setback Setpoints. Stated differently, when configured for Digital NSB Mode, the Accessory Relay directly tracks the NSB input.

**Note: Digital Night Setback feature requires a compatible thermostat. Contact manufacturer for information on compatible thermostats.**

When Digital NSB is NOT selected via the Accessory Relays DIP switch inputs and the NSB input is connected to Ground "C", then Y1, Y2, W1 and O/W2 and G are ignored. During this time period, if OVR is momentarily connected to 24VAC, then Y1, Y2, W1 and O/W2 and G are once again monitored for 2 hours. After the 2 hour override period, the DXM reverts back to ignoring Y1, Y2, W1, and O/W2 and G, assuming the NSB input is still connected to Ground "C". There will be a random start timer when coming back from NSB Mode.

**Note: The maximum number of DXM Controls with daisy-chained "NSB" terminals is 75. Also, the maximum total wire resistance of the "NSB" wiring is 500 Ohms.**

**ESD** - ESD is the input for Emergency Shutdown Mode. When the ESD input is connected to Ground "C", all inputs are ignored and all outputs are turned off. There will be a random start timer when coming back from ESD.

**OVR** - OVR is the input for Night Setback Override or Night Low Limit Staged Heating input (NLL). When Digital NSB is NOT selected via the Accessory Relays DIP switch inputs and NSB is connected to Ground "C", then if OVR is momentarily connected to 24VAC (minimum 1 second) then the OVR input is recognized as a Night Setback Override signal and the DXM Control reverts from Night Setback and begins monitoring thermostat inputs for heating and cooling calls for a 2 hour override period. If NSB is connected to ground "C", then if OVR is continuously connected to 24VAC, then the OVR input is recognized as a call for NLL Staged Heating and the control enters NLL Staged Heating.

**H** - The H input function is determined by the setting of DIP2.7. If DIP2.7 = on then the H input is defined as Automatic Dehumidification Mode and is used as an "automatic" counterpart to DIP1.5, meaning if H is connected to 24VAC then the Fan Speed Relay will not turn on during Cooling Stage 2. If H is not connected to 24VAC then the Fan Speed Relay will turn on during Cooling Stage 2.

If DIP2.7 = off then the H input is defined as High Speed Fan input and is used as an input to call for High Speed Fan. If the control is in normal operating modes such as Standby, Cooling or Heating AND the H input is connected to 24VAC, then the Fan Enable and Fan Speed Relays will be on at all times (this operation is very similar to the G/Fan Enable operation).

**Note: Units with Modulating Reheat Option operate differently from the above descriptions. DIP 1.5 should be in the ON position, and 2.7 should be in the OFF position. DIP 2.1, 2.2, and 2.3 indicate whether the DXM will operate with or without dehumidification. Table 2 shows the two available selections for dehumidification, humidistat/dehumidistat operation. With either selection (OFF/OFF/OFF or OFF/ON/ OFF), the DXM microprocessor will operate in Reheat Mode when an external input from a humidistat or dehumidistat is applied to terminal H.**

**Other Outputs** - Table 12 displays input and output signals.
**Electric Heat** - Outputs EH1 and EH2 turn on whenever the DXM Control is in the following modes: Heating Stage 3, Emergency Heat, and Boilerless Operation.
**Status LED** - The Status LED is green. The Status LED indicates what mode the DXM Control is in. See Table 4: "LED and Alarm Relay Operation".
**Test LED** - The Test LED is yellow. The Test LED will be on any time the control is in Test Mode. See Table 4: "LED and Alarm Relay Operation".

**Fault LED** - The Fault LED is red. The Fault LED ALWAYS flashes the corresponding code for the last fault that has occurred. If there is no fault in memory, then the fault LED will flash Code 1. If the Fault type is "Primary" (HP, LP, FP1, FP2, or CO) then the Fault type will always be retained in memory (Primary faults will overwrite Secondary faults). If the Fault type is "Secondary" (Over/Under Voltage, UPS or Swapped FP1/FP2) then the Fault type will only be retained if there are no "Primary" faults in memory. The Secondary Fault types will not "overwrite" the Primary fault memory. See Table 4: "LED and Alarm Relay Operation".

**Communications**
There are two communications ports (Com1 and Com2) which provide robust communications to external DXM Control boards via a simple noise resistant low speed protocol. Wiring to Com1 and Com2 does NOT require the use of shielded wiring for operation; standard thermostat wire can be used.

**Com1** - Com1 is used to communicate thermostat and external calls to other DXM Master/Slave controls. In this configuration, up to 3 heat pumps can be controlled by one thermostat.

**Note: Each heat pump could potentially be a Dual Compressor unit thus there could be up to 6 DXM Controls being controlled by one thermostat. However, only 1 DXM Control in each heat pump will be daisy-chained on Com1.etc**

The Master DXM Control is defined as the DXM Control, which is directly connected to the wall-mounted thermostat, time clock, fire alarm, and humidistat. The Master DXM communicates to the Slave DXM typical signals such as: Y1, Y2, W1, O/W2, G, NSB, ESD, OVR, and H. The Slave DXM Controls should have no direct connections to any exterior devices such as thermostats, time clocks, fire alarms, humidistats, etc.

**Note: When using the Com1 port on DXM controllers to Master/Slave units with ECM blowers it is necessary to revise the units' low voltage wiring. Contact manufacturer's Applications Department for details.**

**Com2** - Com2 is used to communicate thermostat and external calls to a second DXM Control being used for Dual Compressor Function. A heat pump with two compressors will have a DXM Control for each compressor. The Master DXM Control will handle all I/O with external sources as well as monitor and control operations of the Secondary DXM Control. The Master DXM Control is defined as the DXM Control, which is directly connected to the wall-mounted thermostat, time-clock, fire alarm, and humidistat. The Master DXM communicates to the Secondary DXM typical signals such as: Y1, Y2, W1, O/W2, G, NSB, ESD, OVR, and H. The Secondary DXM Control should have no connections to any exterior devices such as thermostats, time clocks, fire alarms, humidistats, etc.

Since the Master and Secondary DXM Controls share CO sensor and water valve/pump restart operations, these 2 signals are shared via communications as well. If either the Master or Secondary DXM Control senses a CO fault, both DXM Controls will fault and/or lockout due to the CO signal. Regarding water valve/pump restart control, if either the Master or Secondary DXM Control faults or goes into Lockout Mode, it will continue to provide water valve/pump restart operation for the other functioning DXM Control.

### Table 5: System Inputs With The Resulting Demand.

Table 5 describes demand changes with differing system input (ESD, NSB, OVR) and DIP input settings. Resulting Demand #1 is derived from Table 4.

| Resulting Demand #1 (From Table 4) | System Inputs | | | NSB Type | Resulting Demand #2 (After ESD, NSB) |
|---|---|---|---|---|---|
| | ESD | NSB | OVR | | |
| - | X | - | - | - | ESD |
| Invalid | - | - | - | - | Invalid |
| All (Excluding Invalid) | - | - | - | - | All (Excluding Invalid) |
| All (Excluding Invalid) | - | - | M | - | All (Excluding Invalid) |
| C1, C2 | - | - | X | - | Invalid |
| OFF, F, H1, H2, or H3 | - | - | X | - | NLL Staged Heating |
| EH | - | - | X | - | EH |
| All (Excluding Invalid) | - | X | - | Mechanical | Standby/OFF |
| All (Excluding Invalid) | - | X | M | Mechanical | All for 2 hours and then revert to Standby/OFF (Excluding Invalid) |
| C1, C2 | - | X | X | Mechanical | Invalid |
| OFF, F, H1, H2, or H3 | - | X | X | Mechanical | NLL Staged Heating |
| EH | - | X | X | Mechanical | EH |
| All (Excluding Invalid) | - | X | - | Digital | All (Excluding Invalid) |
| All (Excluding Invalid) | - | X | M | Digital | All (Excluding Invalid) |
| C1, C2 | - | X | X | Digital | Invalid |
| OFF, F, H1, H2. or H3 | - | X | X | Digital | NLL Staged Heating |
| EH | - | X | X | Digital | EH |

"M" is momentary input
"X" is continuous input

### Table 6: "H" Input With Resulting Demand Modes.

Table 6 describes demand changes with "H" input and DIP 2.1-2.3, and 2.7 settings. Resulting Demand #2 is derived from Table 5.

| Resulting Demand #2 (From Table 5) | H | Auto Dehum / F2 DIP 2.7 | Resulting Demand # 3 (After DIP 2.1-2.3, 2.7 Logic) |
|---|---|---|---|
| Standby/OFF | X | Auto Dehum Mode | Standby/OFF with Auto Dehum enabled |
| Standby/OFF | X | High Fan Mode | F2 |
| F1 | X | Auto Dehum Mode | F1 with Auto Dehum enabled |
| F1 | X | High Fan Mode | F2 |
| C1 | X | Auto Dehum Mode | C1 with fan destage |
| C1 | X | High Fan Mode | *Cooling with High Fan |
| C2 | X | Auto Dehum Mode | C2 with fan destage |
| C2 | X | High Fan Mode | *Cooling with High Fan |
| H1 | X | Auto Dehum Mode | H1 |
| H1 | X | High Fan Mode | Heating with High Fan |
| H2 | X | - | H2 |
| H3 | X | - | H3 |
| EH | X | - | EH |
| Invalid | - | - | Invalid |

* = signifies that High Fan is locked on regardless of any Dehum demands

## DXM Service & Application Notes

### DXM Sensors

**Pressure Switches** - All pressure switches are designed to be normally closed during normal operating conditions, and to open upon fault.

**Condensate Sensor** - The Condensate Sensor input will fault upon sensing impedance less than 100,000 Ohms for 30 continuous seconds. The recommended design uses a single wire terminated with a male 1/4" quick connect located in the drain pan at desired trip level. Upon a high condensate level the water will short between the air coil and the quick connect producing a resistance less than 100,000 Ohms. Since condensate is free of impurities, it has no conductivity. Only the impurities from the drain pan and coil dust or dirt create the conductance. A second ground wire with appropriate terminal to the drain pan can be used with the control to replace the air coil ground path. The Condensate Sensor can also essentially be any open contact that closes upon a fault condition.

**Thermistor Temperature Sensors** - The thermistor is available in the following configurations shown in Table 7. The thermistor is an NTC (negative temperature coefficient) type. The sensor has a 1% tolerance and follows the Table 7 and Chart 2 shown. Table 9 shows the nominal resistance at any given temperature and can be used for field service reference. The sensor will use a minimum of 24 awg wire and be epoxy embedded in the beryllium copper clip.

**Table 7: 1% Sensor Calibration Points**

| Temp (°F) | Minimum Resistance (Ohm) | Maximum Resistance (Ohm) | Nominal Resistance (Ohm) |
|---|---|---|---|
| 78.5 | 9523 | 9715 | 9619 |
| 77.5 | 9650 | 9843 | 9746 |
| 76.5 | 10035 | 10236 | 10135 |
| 75.5 | 10282 | 10489 | 10385 |
| 33.5 | 30975 | 31598 | 31285 |
| 32.5 | 31871 | 32512 | 32190 |
| 31.5 | 32653 | 33310 | 32980 |
| 30.5 | 33728 | 34406 | 34065 |
| 1.5 | 80624 | 82244 | 81430 |
| 0.5 | 83327 | 85002 | 84160 |
| 0.0 | 84564 | 86264 | 85410 |

**Chart 2: Thermistor Nominal Resistance**

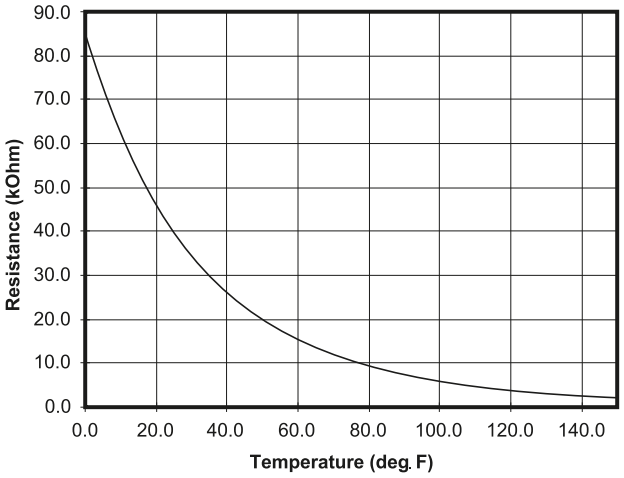



**Table 8: Replacement Thermistor FP1, FP2 Part Numbers**

| Thermistor Type | Tube OD | Lead Length (in.) | | | |
|---|---|---|---|---|---|
| | | 36 | 48 | 96 | 192 |
| FP1 (Gray) | 3/8, 1/2 | 17B0005N06 | N/A | 17B0005N04 | N/A |
| | 5/8, 7/8 | N/A | N/A | 17B0004N01 | N/A |
| FP2 (Violet) | 3/8, 1/2 | N/A | 17B0005N02 | N/A | 17B0005N05 |
| | 5/8, 7/8 | N/A | N/A | N/A | 17B0004N02 |

### Table 9: Nominal Resistance at Various Temperatures

| Temp (ºC) | Temp (ºF) | Resistance (kOhm) | Temp (ºC) | Temp (ºF) | Resistance (kOhm) |
|---|---|---|---|---|---|
| -17.8 | 0.0 | 85.34 | 55 | 131.0 | 2.99 |
| -17.5 | 0.5 | 84.00 | 56 | 132.8 | 2.88 |
| -16.9 | 1.5 | 81.38 | 57 | 134.6 | 2.77 |
| -12 | 10.4 | 61.70 | 58 | 136.4 | 2.67 |
| -11 | 12.2 | 58.40 | 59 | 138.2 | 2.58 |
| -10 | 14.0 | 55.30 | 60 | 140.0 | 2.49 |
| -9 | 15.8 | 52.38 | 61 | 141.8 | 2.40 |
| -8 | 17.6 | 49.64 | 62 | 143.6 | 2.32 |
| -7 | 19.4 | 47.05 | 63 | 145.4 | 2.23 |
| -6 | 21.2 | 44.61 | 64 | 147.2 | 2.16 |
| -5 | 23.0 | 42.32 | 65 | 149.0 | 2.08 |
| -4 | 24.8 | 40.15 | 66 | 150.8 | 2.01 |
| -3 | 26.6 | 38.11 | 67 | 152.6 | 1.94 |
| -2 | 28.4 | 36.18 | 68 | 154.4 | 1.88 |
| -1 | 30.2 | 34.37 | 69 | 156.2 | 1.81 |
| 0 | 32.0 | 32.65 | 70 | 158.0 | 1.75 |
| 1 | 33.8 | 31.03 | 71 | 159.8 | 1.69 |
| 2 | 35.6 | 29.50 | 72 | 161.6 | 1.64 |
| 3 | 37.4 | 28.05 | 73 | 163.4 | 1.58 |
| 4 | 39.2 | 26.69 | 74 | 165.2 | 1.53 |
| 5 | 41.0 | 25.39 | 75 | 167.0 | 1.48 |
| 6 | 42.8 | 24.17 | 76 | 168.8 | 1.43 |
| 7 | 44.6 | 23.02 | 77 | 170.6 | 1.39 |
| 8 | 46.4 | 21.92 | 78 | 172.4 | 1.34 |
| 9 | 48.2 | 20.88 | 79 | 174.2 | 1.30 |
| 10 | 50.0 | 19.90 | 80 | 176.0 | 1.26 |
| 11 | 51.8 | 18.97 | 81 | 177.8 | 1.22 |
| 12 | 53.6 | 18.09 | 82 | 179.6 | 1.18 |
| 13 | 55.4 | 17.26 | 83 | 181.4 | 1.14 |
| 14 | 57.2 | 16.46 | 84 | 183.2 | 1.10 |
| 15 | 59.0 | 15.71 | 85 | 185.0 | 1.07 |
| 16 | 60.8 | 15.00 | 86 | 186.8 | 1.04 |
| 17 | 62.6 | 14.32 | 87 | 188.6 | 1.01 |
| 18 | 64.4 | 13.68 | 88 | 190.4 | 0.97 |
| 19 | 66.2 | 13.07 | 89 | 192.2 | 0.94 |
| 20 | 68.0 | 12.49 | 90 | 194.0 | 0.92 |
| 21 | 69.8 | 11.94 | 91 | 195.8 | 0.89 |
| 22 | 71.6 | 11.42 | 92 | 197.6 | 0.86 |
| 23 | 73.4 | 10.92 | 93 | 199.4 | 0.84 |
| 24 | 75.2 | 10.45 | 94 | 201.2 | 0.81 |
| 25 | 77.0 | 10.00 | 95 | 203.0 | 0.79 |
| 26 | 78.8 | 9.57 | 96 | 204.8 | 0.76 |
| 27 | 80.6 | 9.16 | 97 | 206.6 | 0.74 |
| 28 | 82.4 | 8.78 | 98 | 208.4 | 0.72 |
| 29 | 84.2 | 8.41 | 99 | 210.2 | 0.70 |
| 30 | 86.0 | 8.06 | 100 | 212.0 | 0.68 |
| 31 | 87.8 | 7.72 | 101 | 213.8 | 0.66 |
| 32 | 89.6 | 7.40 | 102 | 215.6 | 0.64 |
| 33 | 91.4 | 7.10 | 103 | 217.4 | 0.62 |
| 34 | 93.2 | 6.81 | 104 | 219.2 | 0.60 |
| 35 | 95.0 | 6.53 | 105 | 221.0 | 0.59 |
| 36 | 96.8 | 6.27 | 106 | 222.8 | 0.57 |
| 37 | 98.6 | 6.01 | 107 | 224.6 | 0.55 |
| 38 | 100.4 | 5.77 | 108 | 226.4 | 0.54 |
| 39 | 102.2 | 5.54 | 109 | 228.2 | 0.52 |
| 40 | 104.0 | 5.33 | 110 | 230.0 | 0.51 |
| 41 | 105.8 | 5.12 | 111 | 231.8 | 0.50 |
| 42 | 107.6 | 4.92 | 112 | 233.6 | 0.48 |
| 43 | 109.4 | 4.72 | 113 | 235.4 | 0.47 |
| 44 | 111.2 | 4.54 | 114 | 237.2 | 0.46 |
| 45 | 113.0 | 4.37 | 115 | 239.0 | 0.44 |
| 46 | 114.8 | 4.20 | 116 | 240.8 | 0.43 |
| 47 | 116.6 | 4.04 | 117 | 242.6 | 0.42 |
| 48 | 118.4 | 3.89 | 118 | 244.4 | 0.41 |
| 49 | 120.2 | 3.74 | 119 | 246.2 | 0.40 |
| 50 | 122.0 | 3.60 | 120 | 248.0 | 0.39 |
| 51 | 123.8 | 3.47 | 121 | 249.8 | 0.38 |
| 52 | 125.6 | 3.34 | 122 | 251.6 | 0.37 |
| 53 | 127.4 | 3.22 | 123 | 253.4 | 0.36 |
| 54 | 129.2 | 3.10 | | | |

### DXM Thermostat Details

**Thermostat Compatibility** - Most all heat pump and heat/cool thermostats can be used with the DXM Control.

**Anticipation Leakage Current** - Maximum leakage current for "Y" is 50mA and for "W" is 20mA. Triacs can be used if leakage current is less than above. Thermostats with anticipators can be used if anticipation current is less than that specified above.

**Thermostat Signals -**

- "Y1, Y2, W1, O/W2" and "G" have a 1 second recognition time when being activated or being removed.
- "R" and "C" are from the transformer.
- "AL1" and "AL2" originate from the Alarm Relay.
- "A" is paralleled with the compressor output for use with well water solenoid valves.

**Safety Listing** - The DXM Control is listed under the UL standard for limit controls and is CE listed uner EN50081-1 and EN61000-3.

## Troubleshooting Information

**General** - DXM board troubleshooting in general is best summarized as simply verifying inputs and outputs. After this process has been verified, confidence in board operation is confirmed and the trouble must be else where. Below are some general guidelines required for developing training materials and procedures when applying the DXM Control.

**DXM Field Inputs** - All inputs are 24VAC from the thermostat and can be verified using a Volt meter between C and Y1, Y2, W, O/W2 and G. See Table 10.

**Sensor Inputs** - All sensor inputs are 'paired wires' connecting each component with the board. Therefore continuity on pressure switches can be checked at the board connector.

The thermistor resistance should be measured with the connector removed so that only the impedance of the thermistor is measured. If desired, this reading can be compared to the chart shown in the thermistor section of this manual based upon the actual temperature of the thermistor clip. An ice bath can be used to check calibration of a thermistor if needed.

**DXM Outputs** - The compressor relay is 24VAC and can be verified using a voltmeter. The Alarm Relay can either be 24VAC as shipped or dry contacts (measure continuity during fault) for use with DDC by clipping the J4 jumper. Electric heat outputs are 24VDC and require a voltmeter set for DC to verify operation. When troubleshooting, measure from 24VDC terminal to EH1 or EH2 terminals. See the I/O Reference table.

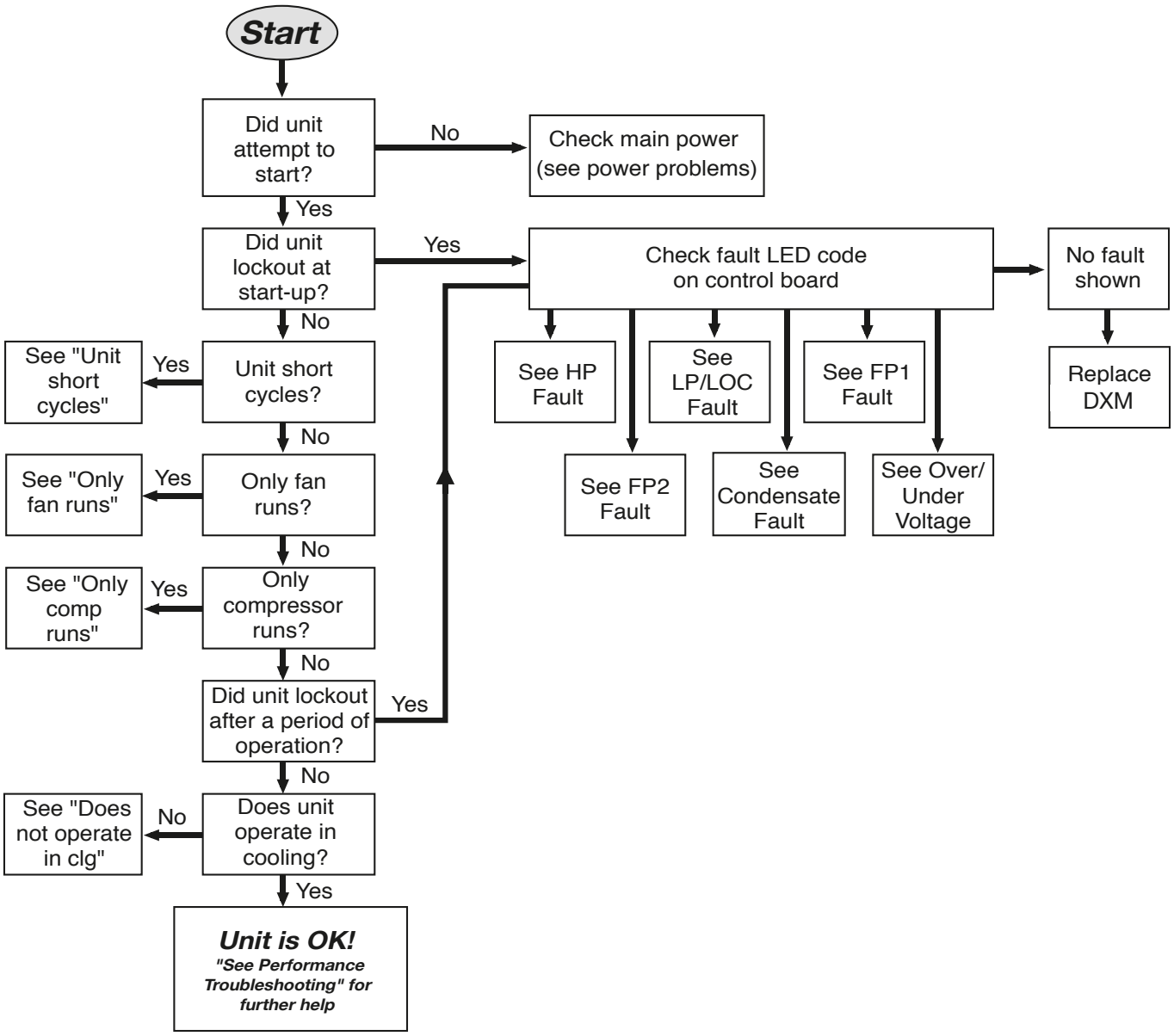
**Test Mode** - Test Mode can be entered for 20 minutes by shorting the test pins. For Diagnostic ease at the thermostat, the Alarm Relay will also cycle during test mode. The Alarm Relay will cycle on and off similar to the fault LED to indicate a code representing the last fault, at the thermostat. Test Mode can also be entered and exited by cycling the G input, 3 times within a 60 second time period.

**Table 10: DXM Input/Output Reference Table**

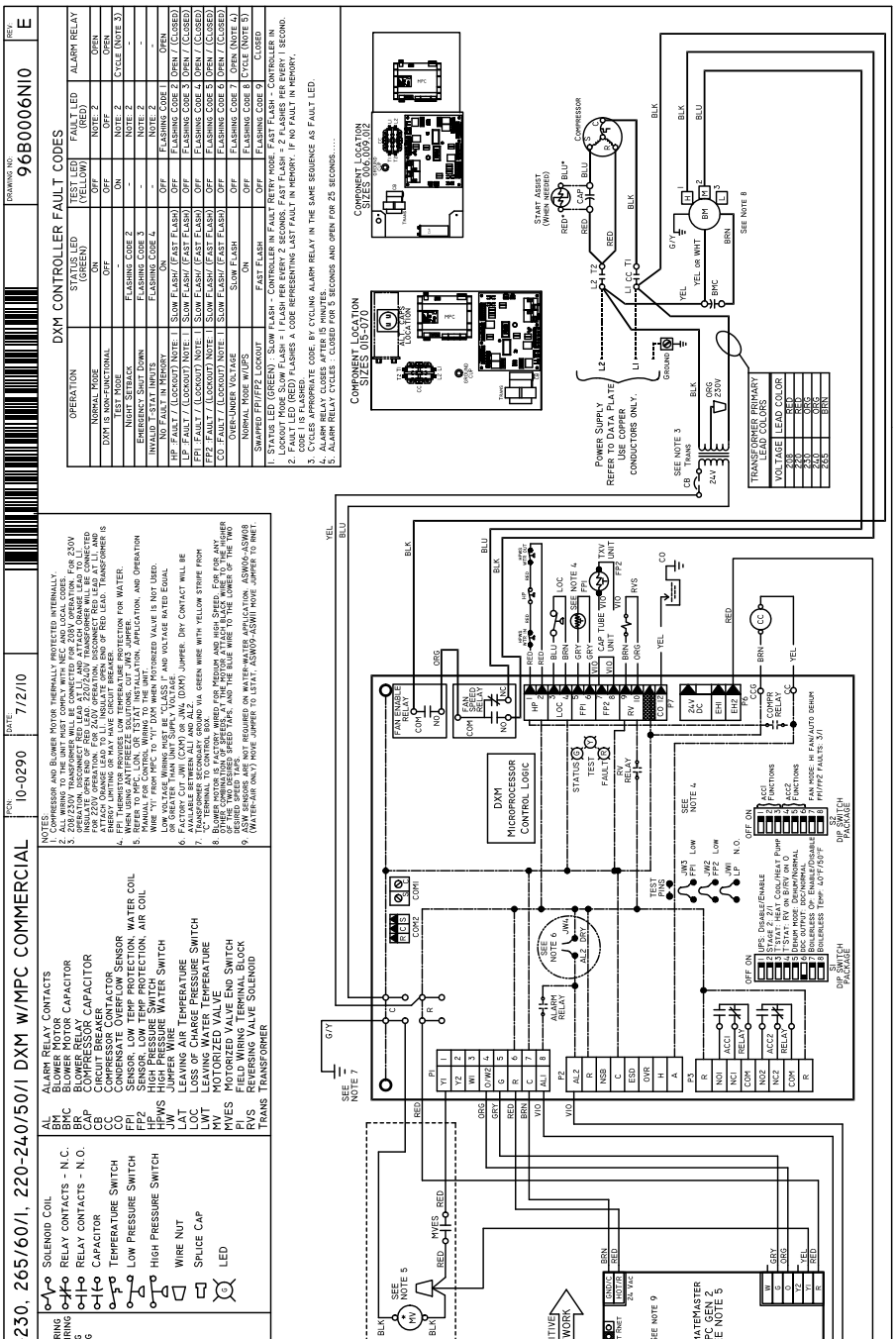
| Connection | Input or Output | Description |
|---|---|---|
| R | - | 24 VAC |
| C | - | 24 VAC (grounded common) |
| Y1 | I | Connect to thermostat - Y1 output call for compressor stage 1 |
| Y2 | I | Connect to thermostat - Y2 output call for compressor stage 2 |
| W1 | I | Connect to thermostat - W1 output call for Htg 3 or Emerg Ht |
| O/W2 | I | Connect to thermostat - 0 output call for reversing valve with cooling |
| G | I | Connect to thermostat - G output call for fan |
| AL1 | O | Connect to thermostat fault light - 24VAC or dry alarm |
| AL2 | O | Alarm Relay 24VAC or dry |
| A | O | Output for water solenoid valve - paralleled with compressor contactor coil |
| Fan Enable | O | Fan enable relay |
| Fan Speed | O | Fan speed relay |
| CC | O | Connection for compressor contactor |
| CCG | O | Compressor contactor common connection |
| HP | I | High Pressure Switch input terminals |
| LP | I | Low Pressure Switch input terminals |
| FP1 | I | Water Coil Low Temperature Thermistor Input |
| FP2 | I | Air Coil Low Temperature Thermistor Input |
| RV | O | Reversing Valve Output Terminals - direct connect from "O" |
| CO | I | Condensate overflow input terminals |
| 24VDC | O | 24 VDC supply to electric heat module |
| EH1 | O | Output terminal for stage 1 electric heat |
| EH2 | O | Output terminal for stage 2 electric heat |
| NSB | I | Night Setback input |
| OVR | I | Night Setback Over Ride Input |
| ESD | I | Emergency Shutdown Input |
| H | I | Dehumidification or High Speed Fan input (dip 2.7) |

## Troubleshooting Chart

Use the following troubleshooting flow chart to find appropriate troubleshooting strategies on the following pages for the DXM Control and most water source heat pump applications.



## DXM Wiring Diagram



## Functional Troubleshooting

| Fault | Htg | Clg | Possible Cause | Solution |
|---|---|---|---|---|
| **Main power problems** | X | X | Green Status LED Off | Check line voltage circuit breaker and disconnect. |
| | | | | Check for line voltage between L1 and L2 on the contactor. |
| | | | | Check for 24VAC between R and C on CXM/DXM' |
| | | | | Check primary/secondary voltage on transformer. |
| **HP Fault Code 2** **High Pressure** | | X | Reduced or no water flow in cooling | Check pump operation or valve operation/setting. |
| | | | | Check water flow adjust to proper flow rate. |
| | | X | Water Temperature out of range in cooling | Bring water temp within design parameters. |
| | X | | Reduced or no air flow in heating | Check for dirty air filter and clean or replace. |
| | | | | Check fan motor operation and airflow restrictions. |
| | | | | Dirty Air Coil- construction dust etc. |
| | | | | Too high of external static. Check static vs blower table. |
| | X | | Air temperature out of range in heating | Bring return air temp within design parameters. |
| | X | X | Overcharged with refrigerant | Check superheat/subcooling vs typical operating condition table. |
| | X | X | Bad HP Switch | Check switch continuity and operation. Replace. |
| **LP/LOC Fault Code 3** **Low Pressure / Loss of Charge** | X | X | Insufficient charge | Check for refrigerant leaks |
| | X | | Compressor pump down at start-up | Check charge and start-up water flow. |
| **LT1 Fault Code 4** **Water coil low temperature limit** | X | | Reduced or no water flow in heating | Check pump operation or water valve operation/setting. |
| | | | | Plugged strainer or filter. Clean or replace.. |
| | | | | Check water flow adjust to proper flow rate. |
| | X | | Inadequate antifreeze level | Check antifreeze density with hydrometer. |
| | X | | Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C]) | Clip JW3 jumper for antifreeze (10°F [-12°C]) use. |
| | X | | Water Temperature out of range | Bring water temp within design parameters. |
| | X | X | Bad thermistor | Check temp and impedance correlation per chart |
| **LT2 Fault Code 5** **Air coil low temperature limit** | | X | Reduced or no air flow in cooling | Check for dirty air filter and clean or replace. |
| | | | | Check fan motor operation and airflow restrictions. |
| | | | | Too high of external static. Check static vs blower table. |
| | | X | Air Temperature out of range | Too much cold vent air? Bring entering air temp within design parameters. |
| | | X | Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C]) | Normal airside applications will require 30°F [-1°C] only. |
| | X | X | Bad thermistor | Check temp and impedance correlation per chart. |
| **Condensate Fault Code 6** | X | X | Blocked drain | Check for blockage and clean drain. |
| | X | X | Improper trap | Check trap dimensions and location ahead of vent. |
| | | X | Poor drainage | Check for piping slope away from unit. |
| | | | | Check slope of unit toward outlet. |
| | | | | Poor venting. Check vent location. |
| | | X | Moisture on sensor | Check for moisture shorting to air coil. |
| | X | X | Plugged air filter | Replace air filter. |
| | x | X | Restricted Return Air Flow | Find and eliminate restriction. Increase return duct and/or grille size. |
| **Over/Under Voltage Code 7** **(Auto resetting)** | X | X | Under Voltage | Check power supply and 24VAC voltage before and during operation. |
| | | | | Check power supply wire size. |
| | | | | Check compressor starting. Need hard start kit? |
| | | | | Check 24VAC and unit transformer tap for correct power supply voltage. |
| | X | X | Over Voltage | Check power supply voltage and 24VAC before and during operation. |
| | | | | Check 24VAC and unit transformer tap for correct power supply voltage. |
| **Unit Performance Sentinel Code 8** | X | | Heating mode FP2>125°F [52°C] | Check for poor air flow or overcharged unit. |
| | | X | Cooling Mode FP1>125°F [52°C] OR FP2< 40ºF [4ºC]) | Check for poor water flow, or air flow. |
| **Swapped Thermistor Code 9** | X | X | LT1 and LT2 swapped | Reverse position of thermistors |
| **No Fault Code Shown** | X | X | No compressor operation | See "Only Fan Operates". |
| | X | X | Compressor overload | Check and replace if necessary. |
| | X | X | Control board | Reset power and check operation. |
| **Unit Short Cycles** | X | X | Dirty air filter | Check and clean air filter. |
| | X | X | Unit in "test mode" | Reset power or wait 20 minutes for auto exit. |
| | X | X | Unit selection | Unit may be oversized for space. Check sizing for actual load of space. |
| | X | X | Compressor overload | Check and replace if necessary |
| **Only Fan Runs** | X | X | Thermostat position | Ensure thermostat set for heating or cooling operation. |
| | X | X | Unit locked out | Check for lockout codes. Reset power. |
| | X | X | Compressor Overload | Check compressor overload. Replace if necessary. |
| | X | X | Thermostat wiring | Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode. |
| **Only Compressor Runs** | X | X | Thermostat wiring | Check G wiring at heat pump. Jumper G and R for fan operation |
| | X | X | Fan motor relay | Jumper G and R for fan operation. Check for Line voltage across BR contacts. |
| | X | X | | Check fan power enable relay operation (if present). |
| | X | X | Fan motor | Check for line voltage at motor. Check capacitor. |
| | X | X | Thermostat wiring | Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode |
| **Unit Doesn't Operate in Cooling** | | X | Reversing valve | Set for cooling demand and check 24VAC on RV coil and at CXM/DXM board. |
| | | | | If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve. |
| | | X | Thermostat setup | Check for 'O' RV setup not 'B'. |
| | | X | Thermostat wiring | Check O wiring at heat pump. Jumper O and R for RV coil 'click'. |
| | | X | Thermostat wiring | Put thermostat in cooling mode. Check 24 VAC on O (check between C and O); check for 24 VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly. |

**⚠ CAUTION! ⚠**

**CAUTION!** Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

## Performance Troubleshooting

| Performance Troubleshooting | Htg | Clg | Possible Cause | Solution |
|---|---|---|---|---|
| **Insufficient capacity/ Not cooling or heating** | X | X | Dirty filter | Replace or clean. |
| | X | | Reduced or no air flow in heating | Check for dirty air filter and clean or replace. |
| | | | | Check fan motor operation and airflow restrictions. |
| | | | | Too high of external static. Check static vs. blower table. |
| | | X | Reduced or no air flow in cooling | Check for dirty air filter and clean or replace. |
| | | | | Check fan motor operation and airflow restrictions. |
| | | | | Too high of external static. Check static vs. blower table. |
| | X | X | Leaky duct work | Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present. |
| | X | X | Low refrigerant charge | Check superheat and subcooling per chart. |
| | X | X | Restricted metering device | Check superheat and subcooling per chart. Replace. |
| | | X | Defective reversing valve | Perform RV touch test. |
| | X | X | Thermostat improperly located | Check location and for air drafts behind stat. |
| | X | X | Unit undersized | Recheck loads & sizing. Check sensible clg. load and heat pump capacity. |
| | X | X | Scaling in water heat exchanger | Perform scaling check and clean if necessary. |
| | X | X | Inlet water too hot or too cold | Check load, loop sizing, loop backfill, ground moisture. |
| **High Head Pressure** | X | | Reduced or no air flow in heating | Check for dirty air filter and clean or replace. |
| | | | | Check fan motor operation and air flow restrictions. |
| | | | | Too high of external static. Check static vs. blower table. |
| | | X | Reduced or no water flow in cooling | Check pump operation or valve operation/setting. |
| | | | | Check water flow. Adjust to proper flow rate. |
| | | X | Inlet water too hot | Check load, loop sizing, loop backfill, ground moisture. |
| | X | | Air temperature out of range in heating | Bring return air temperature within design parameters. |
| | | X | Scaling in water heat exchanger | Perform scaling check and clean if necessary. |
| | X | X | Unit overcharged | Check superheat and subcooling. Re-weigh in charge. |
| | X | X | Non-condensables in system | Vacuum system and re-weigh in charge. |
| | X | X | Restricted metering device. | Check superheat and subcooling per chart. Replace. |
| **Low Suction Pressure** | X | | Reduced water flow in heating. | Check pump operation or water valve operation/setting. |
| | | | | Plugged strainer or filter. Clean or replace. |
| | | | | Check water flow. Adjust to proper flow rate. |
| | X | | Water temperature out of range. | Bring water temperature within design parameters. |
| | | X | Reduced air flow in cooling. | Check for dirty air filter and clean or replace. |
| | | | | Check fan motor operation and air flow restrictions. |
| | | | | Too high of external static. Check static vs. blower table. |
| | | X | Air temperature out of range | Too much cold vent air? Bring entering air temperature within design parameters. |
| | X | X | Insufficient charge | Check for refrigerant leaks. |
| **Low Discharge Air Temperature in Heating** | X | | Too high of air flow | Check fan motor speed selection and air flow chart. |
| | X | | Poor performance | See 'Insufficient Capacity' |
| **High humidity** | | X | Too high of air flow | Check fan motor speed selection and airflow chart. |
| | | X | Unit oversized | Recheck loads & sizing. Check sensible clg load and heat pump capacity. |

Due to ongoing product improvements, specifications and dimensions are subject to change and correction without notice or incurring obligations. Determining the application and suitability for use of any product is the responsibility of the installer. Additionally, the installer is responsible for verifying dimensional data on the actual product prior to beginning any installation preparations.

Incentive and rebate programs have precise requirements as to product performance and certification. All products meet applicable regulations in effect on date of manufacture; however, certifications are not necessarily granted for the life of a product. Therefore, it is the responsibility of the applicant to determine whether a specific model qualifies for these incentive/rebate programs.

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